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55 Leicester Street, Brookline, MA 02146 (US).

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(74) Agents: CERPA, Robert, K. et al.; Morrison & Foerster  
LLP, 755 Page Mill Road, Palo Alto, CA 94304-1018 (US).

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TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.(71) Applicants (*for all designated States except US*): DIGIS-  
CENTS [US/US]; Suite 720, 1814 Franklin Street, Oak-  
land, CA 94612 (US). YEDA RESEARCH AND DE-  
VELOPMENT CO., LTD. [IL/IL]; Weizmann Institute of  
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(72) Inventors; and

(75) Inventors/Applicants (*for US only*): BELLENSON, Joel  
[US/US]; 244 Lakeside Drive, Apartment 15, Oakland,  
CA 94612 (US). SMITH, Dexter [US/US]; 868 Trestle  
Glen Road, Oakland, CA 94610 (US). LANCET, Doron  
[IL/IL]; 15 Weizmann Street, 76280 Rehovot (IL). GLUS-  
MAN, Gustavo [IL/IL]; 33/37 Ha'Alon Street, 79845  
Bnei Ayish (IL). FUCHS, Tania [IL/IL]; 12 Harav neria

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(54) Title: OLFACTORY RECEPTOR SEQUENCES

(57) Abstract: The present invention provides polynucleotide sequences which encode polypeptides involved in olfactory sensation. The present invention also provides the polypeptides encoded by these polynucleotide sequences, vectors comprising these polynucleotide sequences and host cells transfected with these polynucleotide sequences. The present invention further provides for functional variants and homologues of these polynucleotide sequences and the polypeptides encoded by these polynucleotides. Libraries of polypeptides are also provided. Also included in the present invention is the use of these polypeptides and libraries of polypeptides in screening odorant molecules to determine the correspondence (scent representation, scent fingerprint or scent profile) between individual odorant receptors (the polypeptides) and particular odorant molecules. Also encompassed by the present invention is the use of the scent representation, scent fingerprint or scent profile to re-create and edit scents.

## CLAIMS

What is claimed is:

- 5           1.     An isolated and purified polynucleotide sequence encoding an olfactory receptor and having the nucleotide sequence selected from the group consisting of SEQ ID NO:1 through SEQ ID NO: 73 and SEQ ID NO:111 through SEQ ID NO:152, or a nucleotide sequence that is at least about 95% homologous to a nucleotide sequence of the group consisting of SEQ ID NO:1 through SEQ ID NO: 73 and SEQ ID NO:111 through  
10    SEQ ID NO:152 and encoding a polypeptide having olfactory receptor function.
2.     An expression vector comprising a polynucleotide sequence of claim 1.
3.     A host cell comprising the expression vector of claim 2.
- 15           4.     An isolated and purified olfactory receptor polypeptide comprising the translated sequence of SEQ ID NO:1 through SEQ ID NO: 73 and SEQ ID NO:111 through SEQ ID NO:152, or a polypeptide sequence that is at least about 95% homologous to a polypeptide sequence of the group consisting of the translated sequence of SEQ ID  
20    NO:1 through SEQ ID NO: 73 and SEQ ID NO:111 through SEQ ID NO:152 and having olfactory receptor function.
5.     A host cell expressing a polypeptide of claim 4 or a functional fragment thereof.
- 25           6.     A phage expressing a polypeptide of claim 4 or a functional fragment thereof.
7.     A preparation containing a polypeptide of claim 4, further comprising  
30    biological or synthetic molecules which maintain the functional structure of the polypeptide.

8. An isolated and purified polynucleotide sequence encoding an olfactory receptor and having the nucleotide sequence selected from the group consisting of SEQ ID NO: 153 through SEQ ID NO: 1084 or a nucleotide sequence having a sequence at least about 95% homologous to a nucleotide sequence of the group consisting of SEQ ID NO: 153 through SEQ ID NO: 1084 and encoding a polypeptide having olfactory receptor function.
9. An expression vector comprising a polynucleotide sequence of claim 8.
10. A host cell comprising the expression vector of claim 9.
11. An isolated and purified olfactory receptor polypeptide comprising the sequence of SEQ ID NO: 1085 through SEQ ID NO: 2008, or a polypeptide sequence that is at least about 95% homologous to a polypeptide sequence of the group consisting of SEQ ID NO: 1085 through SEQ ID NO: 2008 and having olfactory receptor function.
12. A host cell expressing a polypeptide of claim 11 or a functional fragment thereof.
13. A phage expressing a polypeptide of claim 11 or a functional fragment thereof.
14. A preparation containing a polypeptide of claim 11, further comprising biological or synthetic molecules which maintain the functional structure of the polypeptide.
15. A library of olfactory receptors suitable for determining the interaction pattern of a composition with the receptors, comprising the expression products of at least two polynucleotides of SEQ ID NO:1 through SEQ ID NO: 73, SEQ ID NO:111 through SEQ ID NO:152, and SEQ ID NO: 153 through SEQ ID NO: 1084 wherein said polynucleotides encode functional olfactory receptors; or functional fragments of said expression products.

16. A library of olfactory receptors according to claim 15, wherein the library comprises the expression products of at least 50 polynucleotides of SEQ ID NO:1 through SEQ ID NO: 73, SEQ ID NO:111 through SEQ ID NO:152, and SEQ ID NO: 153 through  
5 SEQ ID NO: 1084 wherein said polynucleotides encode functional olfactory receptors; or functional fragments of said expression products.

17. A library of olfactory receptors according to claim 15, wherein the library comprises the expression products of at least 100 polynucleotides of SEQ ID NO:1 through  
10 SEQ ID NO: 73, SEQ ID NO:111 through SEQ ID NO:152, and SEQ ID NO: 153 through SEQ ID NO: 1084 wherein said polynucleotides encode functional olfactory receptors; or functional fragments of said expression products.

18. A library of olfactory receptors according to claim 15, wherein the library  
15 comprises the expression products of at least 200 polynucleotides of SEQ ID NO:1 through SEQ ID NO: 73, SEQ ID NO:111 through SEQ ID NO:152, and SEQ ID NO: 153 through SEQ ID NO: 1084 wherein said polynucleotides encode functional olfactory receptors; or functional fragments of said expression products.

19. A library of olfactory receptors according to claim 15, wherein the library  
20 comprises the expression products of at least 500 polynucleotides of SEQ ID NO:1 through SEQ ID NO: 73, SEQ ID NO:111 through SEQ ID NO:152, and SEQ ID NO: 153 through SEQ ID NO: 1084 wherein said polynucleotides encode functional olfactory receptors; or functional fragments of said expression products.

20. A library of olfactory receptors suitable for determining the interaction  
25 pattern of a composition with the receptors, comprising at least two polypeptides of SEQ ID NO: 1085 through SEQ ID NO: 2008, wherein said polypeptides are functional olfactory receptors; or functional fragments of said polypeptides.

21. A library of olfactory receptors according to claim 20, wherein the library  
30 comprises at least 50 polypeptides of SEQ ID NO: 1085 through SEQ ID NO: 2008,

wherein said polypeptides are functional olfactory receptors; or functional fragments of said polypeptides.

22. A library of olfactory receptors according to claim 20, wherein the library  
5 comprises at least 100 polypeptides of SEQ ID NO: 1085 through SEQ ID NO: 2008,  
wherein said polypeptides are functional olfactory receptors; or functional fragments of  
said polypeptides.

23. A library of olfactory receptors according to claim 20, wherein the library  
10 comprises at least 200 polypeptides of SEQ ID NOS of SEQ ID NO: 1085 through SEQ  
ID NO: 2008, wherein said polypeptides are functional olfactory receptors; or functional  
fragments of said polypeptides.

24. A library of olfactory receptors according to claim 20, wherein the library  
15 comprises at least 500 polypeptides of SEQ ID NO: 1085 through SEQ ID NO: 2008,  
wherein said polypeptides are functional olfactory receptors; or functional fragments of  
said polypeptides.

25. A method for determining the binding pattern of a composition with  
20 olfactory receptors, comprising the steps of:  
exposing the composition to a library according to claim 21; and  
determining whether the composition binds to each olfactory receptor, thereby  
determining the overall binding patter of the composition.

25 26. The method of claim 25, wherein the composition consists essentially of one  
compound or chemical.

27. The method of claim 25, wherein the composition comprises at least two  
compounds or chemicals.

30 28. The method of claim 25, wherein the step of determining whether the  
composition binds to each olfactory receptor further comprises a determination of the

approximate binding constant with which the composition binds to each receptor or functional fragment thereof.

29. The method of claim 25, further comprising the step of determining whether  
5 a receptor or functional fragment thereof to which the composition binds is activated.

30. The method of claim 29, further comprising the step of determining the  
absolute or relative amount by which the receptor or functional fragment thereof is  
activated.

10

31. A DNA array or a DNA chip comprising DNA segments derived from SEQ ID  
NO: 153 through SEQ ID NO: 1084.

32. A method of determining differences among individuals with respect to their  
15 olfactory faculties, comprising the steps of comparing the olfactory DNA of the individual  
against the array or chip of claim 31.

33. A method to determine single nucleotide polymorphisms in olfactory receptors,  
comprising the steps of uniquely amplifying olfactory receptor sequences from DNA  
20 obtained from one or more individuals, based on primers designed according to the first 25  
bases and the last 25 bases of any combination of, or each of, SEQ ID NO: 153 through  
SEQ ID NO: 1084, and determining the similarities and differences between said amplified  
DNA and the corresponding receptor from SEQ ID NO: 153 through SEQ ID NO: 1084.

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&lt;211&gt; 954

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&lt;213&gt; Unknown (H38g753 nucleotide)

&lt;220&gt;

&lt;223&gt; Synthetic construct

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&lt;210&gt; 904

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&lt;212&gt; DNA

&lt;213&gt; Unknown (H38g754 nucleotide)

&lt;220&gt;

&lt;223&gt; Synthetic construct

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 Glu Asn Phe Leu Leu Ala Ser Met Ala Tyr Asp Arg Tyr Asp Ala Val  
 130 135 140  
 Cys Lys Pro Leu His Tyr Thr Thr Thr Met Thr Thr Ser Val Cys Ala  
 145 150 155 160  
 Cys Leu Ala Ile Ile Cys Tyr Val Cys Gly Phe Leu Asn Ala Ser Ile  
 165 170 175  
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 180 185 190  
 His Cys Phe Phe Cys Asp Val Pro Pro Val Met Ala Leu Ser Cys Cys  
 195 200 205  
 Asp Arg His Val Asn Glu Leu Val Leu Ile Tyr Val Ala Ser Phe Asn  
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&lt;210&gt; 1835

&lt;211&gt; 318

&lt;212&gt; PRT

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&lt;220&gt;

&lt;223&gt; Synthetic construct

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&lt;210&gt; 1836

&lt;211&gt; 330

&lt;212&gt; PRT

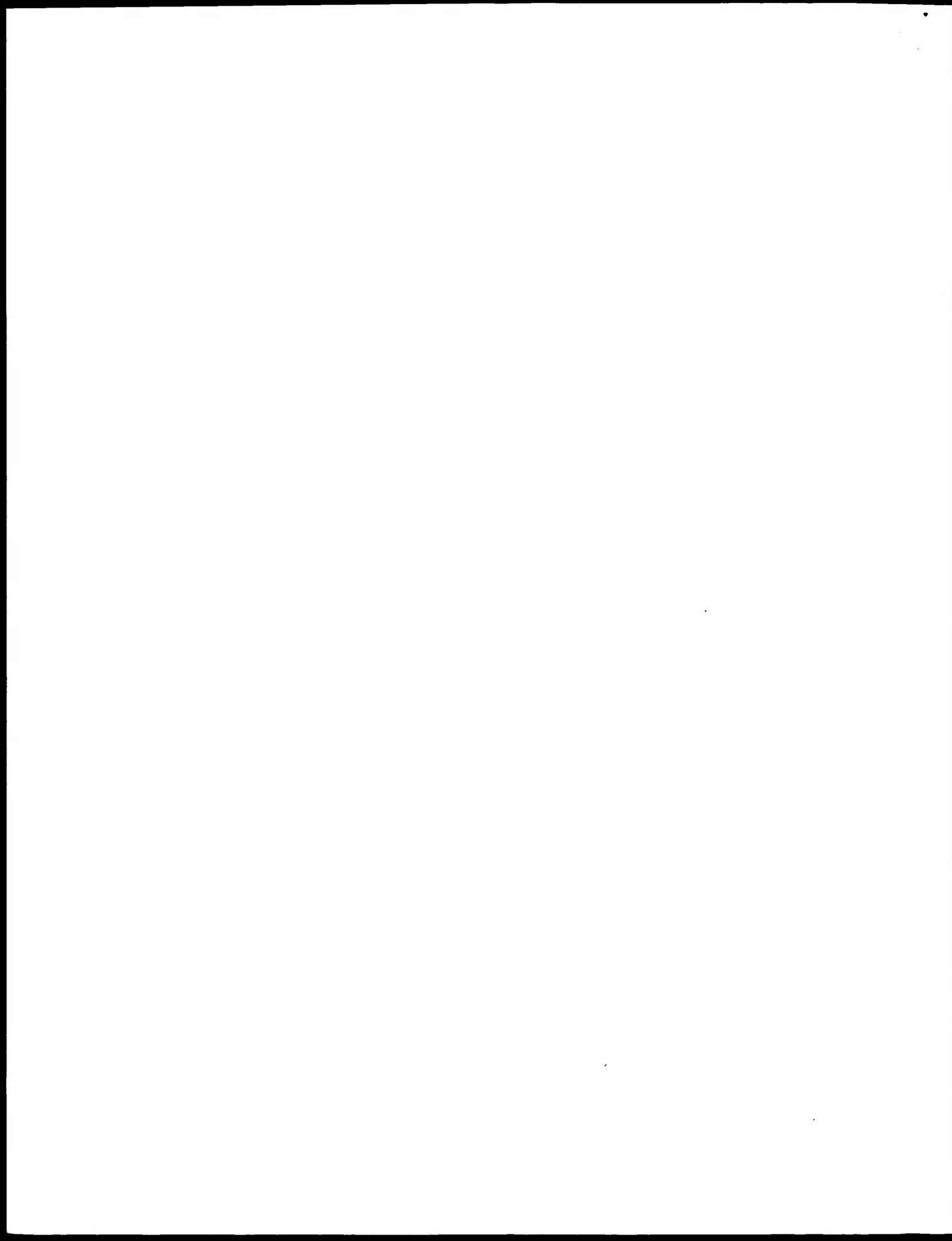
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&lt;220&gt;

&lt;223&gt; Synthetic construct

&lt;400&gt; 1836

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			245					250					255		



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 100 105 110  
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 Gly Arg Ile Gly Phe Val Gly Leu Phe Arg Ser Val Ala Ile Val Ser  
 145 150 155 160  
 Pro Phe Ile Phe Leu Leu Arg Arg Leu Pro Tyr Cys Gly His Arg Val  
 165 170 175  
 Met Thr His Thr Tyr Cys Glu His Met Gly Ile Ala Arg Leu Ala Cys  
 180 185 190  
 Ala Asn Ile Thr Val Asn Ile Val Tyr Gly Leu Thr Val Ala Leu Leu  
 195 200 205  
 Ala Met Gly Leu Asp Ser Ile Leu Ile Ala Ile Ser Tyr Gly Phe Ile  
 210 215 220  
 Leu His Ala Val Phe His Leu Pro Ser His Asp Ala Gln His Lys Ala  
 225 230 235 240  
 Leu Ser Thr Cys Gly Ser His Ile Gly Ile Ile Leu Val Phe Tyr Ile  
 245 250 255  
 Pro Ala Phe Phe Ser Phe Leu Thr His Arg Phe Gly His His Glu Val  
 260 265 270  
 Pro Lys His Val His Ile Phe Leu Ala Asn Leu Tyr Val Leu Val Pro  
 275 280 285  
 Pro Val Leu Asn Pro Ile Leu Tyr Gly Ala Arg Thr Lys Glu Ile Arg  
 290 295 300  
 Ser Arg Leu Leu Lys Leu Leu His Leu Gly Lys Thr Ser Ile Xaa Met  
 305 310 315 320  
 Leu Ser Arg Ser

&lt;210&gt; 2183

&lt;211&gt; 317

&lt;212&gt; PRT

&lt;213&gt; Homo sapien (7658481-18-4217-6941)

&lt;400&gt; 2183

Met Ser Gln Val Thr Asn Thr Thr Gln Glu Gly Ile Tyr Phe Ile Leu  
 1 5 10 15  
 Thr Asp Ile Pro Gly Phe Glu Ala Ser His Ile Trp Ile Ser Ile Pro  
 20 25 30  
 Val Cys Cys Leu Tyr Thr Ile Ser Ile Met Gly Asn Thr Thr Ile Leu  
 35 40 45  
 Thr Val Ile Arg Thr Glu Pro Ser Val His Gln Arg Met Tyr Leu Phe  
 50 55 60  
 Leu Ser Met Leu Ala Leu Thr Asp Leu Gly Leu Thr Leu Thr Thr Leu  
 65 70 75 80  
 Pro Thr Val Met Gln Leu Leu Trp Phe Asn Val Arg Arg Ile Ser Ser  
 85 90 95  
 Glu Ala Cys Phe Ala Gln Phe Phe Phe Leu His Gly Phe Ser Phe Met  
 100 105 110  
 Glu Ser Ser Val Leu Leu Ala Met Ser Val Asp Cys Tyr Val Ala Ile  
 115 120 125  
 Cys Cys Pro Leu His Tyr Ala Ser Ile Leu Thr Asn Glu Val Ile Gly

